REMARKS

In the present response claim 1 is amended. Support for the amendments of claim 1 may be found on page 6, lines 1-2 of the application text as filed and in original claim 3. Claims 7-11 are added. Claims 1, 2, and 4-11 are pending in the present application.

In the Office Action of February 7, 2006 claims 1 and 3-6 were rejected under 35 USC §102(b) as being anticipated by, or in the alternative, under 35 USC §103(a) as being obvious over Fitzpatrick et al (US. Patent No. 4,617,490). Applicants respectfully traverse the rejection.

Claim 1 provides a coolant composition comprising 1,3-propanediol having an electrical resistivity of greater than 250 Kohm-cm.

Fitzpatrick et al provides a light filtering solution for cathode ray tubes containing a salt of praseodymium, erbium, holmium, or neodymium in an aqueous solution of a aliphatic alcohol such as 1,3-propanediol, where cinnamaldehyde, cinnamic alcohol, or a mixture of these compounds is added to the filtering solution.

In the Office Action, the examiner acknowledges that the Fitzpatrick reference is silent with respect to the electrical resistivity of the light filtering solution, but alleges that such electrical resistivity would be inherent to the compositions of the Fitzpatrick reference. In relying upon the theory of inherency, the examiner must provide a basis in fact and/or technical reasoning to reasonably support the determination that the allegedly inherent characteristic necessarily flows from the teachings of the applied art. *Ex Parte* Levy, 17 USPQ 2d 1461, 1464 (Bd. Pat. App. & Inter. 1990); MPEP 2112 Section IV. The examiner relies on technical reasoning that Fitzpatrick teaches the use of 1,3 propanediol as a solution that has coolant and antifreeze properties, and, therefore, would inherently have all the elements of the coolant claimed in claim 1.

No proof is submitted by the examiner regarding the electrical resistivity of the solutions of the Fitzpatrick reference, and Applicants respectfully submit that the examiner's technical reasoning is not reasonable. All of the light filtering solutions of the Fitzpatrick reference include salts that act as filters of undesirable wavelengths of light. In solutions, electrical current is carried by ions, where salts that dissolve in the solution provide ions to the solution. In general, the higher the concentration of salt in a solution

the more conductive a solution will be, and, reciprocally, the less resistant the solution will be. For example, ultrapure water is very low in conductivity and high in resistivity since it contains few ions (conductivity = 0.000055 mho-cm^{-1}; resistivity = [1/conductivity] = 1818 Kohm-cm); while a 5% aqueous solution of NaCl is relatively high in conductivity and low in resistivity (conductivity = 0.223 mho-cm^{-1}; resistivity = 0.004 Kohm-cm). *See* Exhibit A, Measurement of Conductivity, Table 1.

The salts used in the light filtering solutions disclosed by Fitzpatrick are present in significant amounts—praseodymium salt solutions are disclosed as containing 6-13% praseodymium salt by weight, erbium salt solutions are disclosed as containing 20-40 wt.% erbium, and holmium and neodymium salt solutions are disclosed as containing from 40-75 grams of holmium or neodymium salt, respectively, per 100 ml of solvent. These ionic solutions will have an electrical resistivity less than 250 Kohm-cm. For example, praseodymium chloride, erbium chloride, holmium chloride, and neodymium chloride, all disclosed as salts useful in the light filtering solutions of the Fitzpatrick reference, provide more inherent electrical conductivity than NaCl in aqueous solutions. [NaCl =126.4 m^{2}mho/mol; $PrCl_3$ = 145.8 m^{2}mho/mol; $ErCl_3$ = 142.2 m^{2}mho/mol; $HoCl_3$ = 142.3 m^{2}mho/mol; and $NdCl_3$ = 145.7 m^{2}mho/mol—all measured in aqueous solution at 25°C and infinite solubility (*see* Exhibit B, CRC Handbook of Chemistry and Physics, Equivalent Conductivity of Electrolytes in Aqueous Solution , and Equivalent Ionic Conductivity at Infinite Dilution)]. Therefore, the Fitzpatrick reference does not inherently anticipate the coolant of claim 1 or its dependent claims.

The coolant as claimed in claim 1 is not obvious from the light filtering solutions disclosed by the Fitzpatrick reference due to the high resistivity of at least 250 Kohm-cm required for the claimed coolant. High resistivity is particularly useful in coolants used in fuel cell engines since fuel cell engines generate significant electrical potential, and the coolant flowing around the aluminum components of the fuel cell must be non-conductive (e.g. highly resistive) to prevent the fuel cell from shorting out. One skilled in the art would not consider the salt containing solutions disclosed by the reference for use as a coolant requiring an electrical resistivity of at least 250 Kohm-cm due to ionic nature of the salt containing solutions. *See, e.g.*, application text as filed, page 6 line 25 – page 7, line 2, especially page 6 line 33 - page 7 line 1.

In the Office Action of February 7, 2006 claims 1 and 3 were rejected under 35 U.S.C. §102(b) as anticipated by, or in the alternative, under 35 U.S.C. §103(a) as obvious over Harman et al. (U.S. Patent No. 2,725,359). Applicants respectfully traverse the rejection.

The Harman et al. reference discloses a lubricating oil composition suitable for use as a coolant and/or corrosion inhibiting composition. The composition contains a lubricating additive comprising a class of polyphospho-organic compounds (col. 3, lines 5-7). The composition also contains a "vehicle" to which the lubricating additive is added, which may be trimethylene glycol (col. 7, lines 17-21 and 32). The composition may also contain oil-soluble salts (col. 9 line 40 – col. 10 line 22).

Claim 1, as amended, is novel with respect to the compositions disclosed by Harman et al. since the claimed composition is required to be aqueous. The trimethylene glycol composition disclosed in the Harman reference is not disclosed as containing any water, and therefore, is not an aqueous solution. The aqueous cooling solution claimed in claim 1 is not obvious over the Harman reference, again, because the Harman reference provides no teaching of an aqueous 1,3-propanediol having the claimed characteristics and provides no direction that would lead one skilled in the art to formulate an aqueous 1,3-propanediol having the claimed characteristics. Harman does disclose that the addition of salts is useful in the disclosed composition [col. 9, line 40- col. 10 line 22]. As noted above, increasing the salt concentration of the composition decreases its electrical resistivity—therefore, Harman would direct one skilled in the art away from the composition as claimed in claim 1. Claim 3 has been cancelled.

In the Office Action of February 7, 2006, claims 1-5 were rejected under 35 U.S.C. §102(b) as anticipated by, or in the alternative, as obvious over, Nambu (U.S. Patent No. 4,925,603). Applicants respectfully traverse the rejection.

As amended, claim 1 requires a aqueous 1,3-propanediol that has a viscosity of less than 6 cPs at 0°C. Nambu teaches a composition that is a combination of a polyvinyl alcohol and a polyhydric alcohol, which may be 1,3-propanediol. Nambu does not expressly disclose the viscosity of a polyvinyl alcohol/1,3-propanediol mixture at 0°C, therefore, Nambu does not expressly disclose the composition of claim 1 or its dependent claims. Nambu also does not inherently disclose the composition of claim 1 and its

dependent claims because the composition of Nambu is a gel at ambient temperatures and below—and a gel has a viscosity that is greater than 6 cPs when held at 0°C. [*See, e.g.*, col. 15, lines 50-58, gel of Nambu invention has a melting point higher than 100°C]. The composition of claim 1 is not obvious from the disclosure of Nambu because the composition of claim 1 requires a viscosity of less than 6 cPs at 0°C, and Nambu teaches a composition that forms a gel at such temperatures. One skilled in the art would not apply the teachings of Nambu to derive a composition having a viscosity of less than 6 cPs at 0°C since one skilled in the art would recognize that the gels disclosed in Nambu would have a viscosity greater than 6 cPs at 0°C. Claims 2 and 4-5 depend from claim1, and are novel and non-obvious over Nambu for the reasons that claim 1 is novel and non-obvious over Nambu. Claims 2 and 3 have been cancelled.

In the Office Action of February 7, 2006, claims 1 and 3-6 were rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1-6 of U.S. Patent No. 6,818,146. Applicants have filed a terminal disclaimer with this response to overcome the rejection with respect to the pending claims.

In the Office Action of February 7, 2006, claims 1 and 3-6 were provisionally rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over the claims of co-pending Application No. 10/886,298. Applicants respectfully traverse the rejection.

Non-statutory obviousness-type double patenting rejections are applicable only when the applications or patents are commonly owned. The present application was assigned by the inventors to Shell Oil Company, the present owner of the application. Application No. 10/886,298 was assigned by the inventors to DuPont Staley Bio-Products, not Shell Oil Company. As such, the non-statutory obviousness-type double patenting rejection in the present application is inapplicable.

In light of the above, Applicants respectfully request allowance of the pending claims.

Respectfully submitted,

EDWARD R. EATON,
WYNDHAM H. BOON
and CHRISTOPHER J. SMITH

By:______________________

Richard B. Taylor Reg. No. 37,248
Senior Counsel
Shell Oil Company
(713) 241-3558

P.O. Box 2463
Houston, TX 77252-2463

EXHIBIT A

Measurement of Conductivity

Conductivity Measurement Theory and Practice

Background

Electrical conductivity is an inherent property of most materials, and ranges from extremely conductive materials like metals to very non-conductive materials like plastics or glass. About halfway between the two extremes in conductivity are aqueous solutions, such as sea water and plating baths.

In metals, the electrical current is carried by electrons, while in water it is carried by charged ions. In both cases, the conductivity is determined by the number of charge carriers, how fast they move, and how much charge each one carries.

Thus, for most water solutions, the higher the concentration of dissolved salts, which will lead to more ions, the higher the conductivity. This effect continues until the solution gets "too crowded," restricting the freedom of the ions to move, and the conductivity may actually decrease with increasing concentration. (This can result in two different concentrations of a salt having the same conductivity.) See **Table 1.**

Some species ionize more completely in water than others do, and their solutions are more conductive as a result. Each acid, base, or salt has its own characteristic curve for concentration vs. conductivity.

Metals are extremely conductive because electrons move almost with the speed of light, while in water ions move much slowly, and the conductivity is much lower. Raising the temperature makes water less viscous, and the ions can move faster. Because the ions are of different sizes, and carry different amounts of water with them as they move, the temperature effect is different for each ion. Typically, the conductivity varies about 1-3% per degree C, and this temperature coefficient may itseif vary with concentration and temperature. See **Tables 1 and 2.**

Definitions

The conductivity of a material is an inherent property-that is, pure water at a particular temperature will always have the same conductivity. The *conductance* of a sample of pure water depends on how the measurement is made-how big a sample, how far apart the measuring electrodes are, etc. It is defined as the reciprocal of the resistance in ohms, measured between the

opposing faces of a 1 cm cube of liquid at a specific temperature. See **Figure 1.** The basic unit of conductance is the *Siemens* (S) and was formerly called the mho. Because a measurement gives the conductance, techniques have been worked out to convert the measured value to the conductivity, so that results can be compared from different experiments. This is done by measuring a *cell constant* for each setup, using a solution of known conductivity.

Cell Conductance X K = Conductivity (Equation 1)

The cell constant is related to the physical characteristics of the measuring cell. K is defined for two flat, parallel measuring electrodes as the electrode separation distance (d) divided by the electrode area (A). Thus, for a 1 cm cube of liquid,

$K = d/A = 1\ cm^{-1}$ (Equation 2)

In practice, the measured cell value is entered into the meter, and the conversion from conductance to conductivity is done automatically. The K value used varies with the linear measuring range of the cell selected. Typically, a cell with $K = 0.1\ cm^{-1}$ is chosen for pure water measurements, while for environmental water and industrial solutions a cell with K of 0.4 to 1 cm^{-1} is used. Cells with up to $K = 10\ cm^{-1}$are best for very high conductivity samples.

For some solutions, such as pure water, the conductivity numbers are so low that some users prefer to use *resistivity and resistance* instead. The resistivity is the reciprocal of the conductivity (R = 1/C), and the resistance is the reciprocal of the conductance. Resistance units are in ohms, and 1 ohm = 1/Siemens. From Eq. 1 and 2, it can be seen that conductivity units are in Siemens/cm, and therefore resistivity units are in ohm-cm.
measured temperature, temperature coefficient and reference temperature, will report sample conductivity

How is conductivity measured?

In the simplest arrangement (a *2-electrode* cell), a voltage is applied to two flat plates immersed in the solution, and the resulting current is measured. See **Figure 1.** From Ohm's Law, the conductance = currentlvoltage. Actually there are many practical difficulties. Solution conductivity is due to ion mobility. Use of DC voltage would soon deplete the ions near the plates, causing *polarization,* and a higher than actual resistance. This can be mostly overcome by using AC voltage, but then the instrument designer must correct for various capacitance and other effects. Modern sophisticated 2-electrode conductivity instruments use complex AC waveforms to minimize these effects, and by using the cell constant, measured temperature, temperature coefficient and the reference temperature will report sample conductivity.

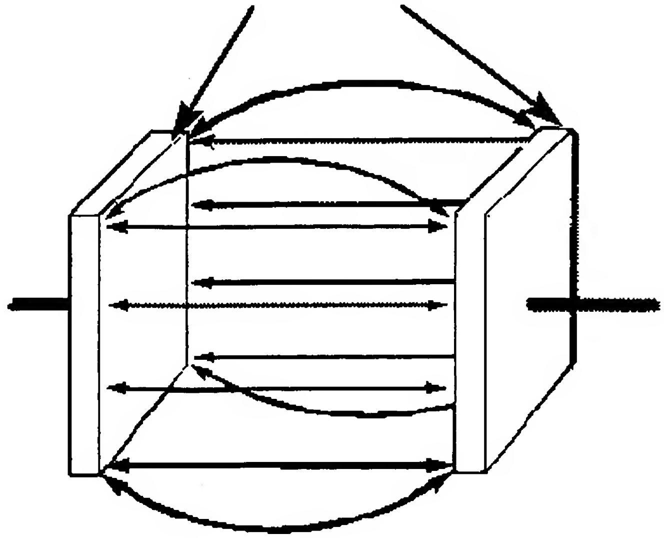

Figure 1.
Conductivity Cell

Table 1
Some Conductivity Values of Typical Samples

Sample at 25°C	**Conductivity microScm^{-1}**
Ultrapure Water	0.055
Power Plant Boiler Water	1.0
Drinking Water	50
Ocean Water	53,000
5% NaCl	223,000
50% NaOH	150,000
10% HCl	700,000
32% HCl	700,000
31% HNO_3	865,000

Table 2
Some typical temperature coefficients

Sample	**Percent per °C (at 25°C)**
Ultrapure Water	4.55
Salt Solution (5%)	2.12
NaOH (5%)	1.72
Dilute Ammonia Solution	1.88
HCl (10%)	1.32
Sulphuric Acid (5%)	0.96
Sulphuric Acid (98%)	2.84

Sugar Syrup	5.64

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tel: +44 (0)1337 828871 | e-mail: sales.water.uk@thermo.com | fax: +44 (0)1337 828972

<u>EXHIBIT B</u>

CRC Handbook of Chemistry and Physics

A Ready-Reference Book of Chemical and Physical Data

HANDBOOK OF CHEMISTRY AND PHYSICS

1990—1991

71st

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Editor-in-Chief

David R. Lide, Ph.D.

CRC Press

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EQUIVALENT CONDUCTIVITY OF ELECTROLYTES IN AQUEOUS SOLUTION

Petr Vanýsek

The values of λ are given in 10^{-4} m^2 S mol^{-1} at a temperature of 25° C.

Compound	Infinite dilution	0.0005	0.001	0.005	0.01	0.02	0.05	0.1
	Concentration mol/l							
	λ							
$AgNO_3$	133.29	131.29	130.45	127.14	124.70	121.35	115.18	109.09
$1/2BaCl_2$	139.91	135.89	134.27	127.96	123.88	119.03	111.42	105.14
$1/2CaCl_2$	135.77	131.86	130.30	124.19	120.30	115.59	108.42	102.41
$1/2Ca(OH)_2$	258	—	—	233	226	214	—	—
$1/2CuSO_4$	133.6	121.6	115.20	94.02	83.08	72.16	59.02	50.55
HCl	425.95	422.53	421.15	415.59	411.80	407.04	398.89	391.13
KBr	151.9	—	—	146.02	143.36	140.41	135.61	131.32
KCl	149.79	147.74	146.88	143.48	141.20	138.27	133.30	128.90
$KClO_4$	139.97	138.69	137.80	134.09	131.39	127.86	121.56	115.14
$1/3K_3Fe(CN)_6$	174.5	166.4	163.1	150.7	—	—	—	—
$1/4K_4Fe(CN)_6$	184		167.16	146.02	134.76	122.76	107.65	97.82
$KHCO_3$	117.94	116.04	115.28	112.18	110.03	107.17	—	—
KI	150.31	—	—	144.30	142.11	139.38	134.90	131.05
KIO_4	127.86	125.74	124.88	121.18	118.45	114.08	106.67	98.2
KNO_3	144.89	142.70	141.77	138.41	132.75	132.34	126.25	120.34
$KMnO_4$	134.8	—	133.3	—	126.5	—	—	113
KOH	271.5	—	234	230	228	—	219	213
$KReO_4$	128.20	126.03	125.12	121.31	118.49	114.49	106.40	97.40
$1/3LaCl_3$	145.9	139.6	137.0	127.5	121.8	115.3	106.2	99.1
LiCl	114.97	113.09	112.34	109.35	107.27	104.60	100.06	95.81
$LiClO_4$	105.93	104.13	103.39	100.52	98.56	96.13	92.15	88.52
$1/2MgCl_2$	129.34	125.55	124.15	118.25	114.49	109.99	103.03	97.05
NH_4Cl	149.6	—	146.7	134.4	141.21	138.25	133.22	128.69
NaCl	126.39	124.44	123.68	120.59	118.45	115.70	111.01	106.69
$NaClO_4$	117.42	115.58	114.82	111.70	109.54	106.91	102.35	98.38
NaI	126.88	125.30	124.19	121.19	119.18	116.64	112.73	108.73
$NaOOCCH_3$	91.0	89.2	88.5	85.68	83.72	81.20	76.88	72.76
$NaOOC_2H_5$	85.88	84.20	83.50	80.86	79.01	76.59	—	—
$NaOOC_3H_7$	82.66	81.00	80.27	77.54	75.72	73.35	69.29	65.24
NaOH	247.7	245.5	244.6	240.7	237.9	—	—	—
Na picrate	80.45	—	78.6	757	73.7	—	66.3	61.8
$1/2Na_2SO_4$	129.8	125.68	124.09	117.09	112.38	106.73	97.70	89.94
$1/2SrCl_2$	135.73	131.84	130.27	124.18	120.23	115.48	108.20	102.14
$1/2ZnSO_4$	132.7	121.3	114.47	95.44	84.87	74.20	61.17	52.61

EQUIVALENT IONIC CONDUCTIVITY AT INFINITE DILUTION

Petr Vanýsek

Values are for aqueous solution at 25° C.

Ion	Λ_o (10^{-4} m^2 S mol^{-1})	Ion	Λ_o (10^{-4} m^2 S mol^{-1})	Ion	Λ_o (10^{-4} m^2 S mol^{-1})
Inorganic cations		Inorganic cations		Inorganic cations	
[illegible]	61.9	$1/3Dy^{3+}$	65.6	NH_4^+	73.5
[illegible]	61	$1/3Er^{3+}$	65.9	$N_2H_5^+$	59
[illegible]	63.6	$1/3Eu^{3+}$	67.8	Na^+	50.08
[illegible]	45	$1/2Fe^{2+}$	54	$1/3Nd^{3+}$	69.4
[illegible]	59.47	$1/3Fe^{3+}$	68	$1/2Ni^{2+}$	50
[illegible]	54	$1/3Gd^{3+}$	67.3	$1/4[Ni_2(trien)_3]^{4+}$	52
[illegible]	69.8	H^+	349.65	$1/2Pb^{2+}$	71
[illegible]	55	$1/2Hg_2^{2+}$	68.6	$1/3Pr^{3+}$	69.5
[illegible]	101.9	$1/2Hg^{2+}$	63.6	$1/2Ra^{2+}$	66.8
[illegible]	74.7	$1/3Ho^{3+}$	66.3	Rb^+	77.8
[illegible]	69	K^+	73.48	$1/3Sc^{3+}$	64.7
[illegible]	67	$1/3La^{3+}$	69.7	$1/3Sm^{3+}$	68.5
[illegible]	77.2	Li^+	38.66	$1/2Sr^{2+}$	59.4
[illegible]	53.6	$1/2Mg^{2+}$	53.0	Tl^+	74.7
[illegible]	213.7 (18°)	$1/2Mn^{2+}$	53.5	$1/3Tm^{3+}$	65.4

EQUIVALENT IONIC CONDUCTIVITY AT INFINITE DILUTION (continued)

Ion	Λ_o (10^{-4} m^2 S mol^{-1})
Inorganic cations	
$1/2UO_2^{2+}$	32
$1/3Y^{3+}$	62
$1/3Yb^{3+}$	65.6
$1/2Zn^{2+}$	52.8
Inorganic anions	
$Au(CN)_2^-$	50
$Au(CN)_4^-$	36
$B(C_6H_5)_4^-$	21
Br^-	78.1
Br_3^-	43
BrO_3^-	55.7
CN^-	78
CNO^-	64.6
$1/2CO_3^{2-}$	69.3
Cl^-	76.31
ClO_2^-	52
ClO_3^-	64.6
ClO_4^-	67.3
$1/3[Co(CN)_6]^{3-}$	98.9
$1/2CrO_4^{2-}$	85
F^-	55.4
$1/4[Fe(CN)_6]^{4-}$	110.4

Ion	Λ_o (10^{-4} m^2 S mol^{-1})
Inorganic anions	
$1/3[Fe(CN)_6]^{3-}$	100.9
$H_2AsO_4^-$	34
HCO_3^-	44.5
HF_2^-	75
$1/2HPO_4^{2-}$	33
$H_2PO_4^-$	33
$H_2PO_2^-$	46
HS^-	65
HSO_3^-	50
HSO_4^-	50
$H_2SbO_4^-$	31
I^-	76.8
IO_3^-	40.5
IO_4^-	54.5
MnO_4^-	61.3
MoO_4^-	74.5
$N(CN)_2^-$	54.5
NO_2^-	71.8
NO_3^-	71.42
$NH_2SO_3^-$	48.6
N_3^-	69

Ion	Λ_o (10^{-4} m^2 S mol^{-1})
Inorganic anions	
OCN^-	64.6
OH^-	198
PF_6^-	56.9
$1/2PO_3F^{2-}$	63.3
$1/2PO_4^{3-}$	69.0
$1/4P_2O_7^{4-}$	96
$1/3P_3O_9^{3-}$	83.6
$1/5P_3O_{10}^{5-}$	109
$1/3P_4O_{13}^{2-}$	94
ReO_4^-	54.9
SCN^-	66
$1/2SO_3^{2-}$	79.9
$1/2SO_4^{2-}$	80.0
$1/2S_2O_3^{2-}$	85.0
$1/2S_2O_4^{2-}$	66.5
$1/2S_2O_6^{2-}$	93
$1/2S_2O_8^{2-}$	86
$Sb(OH)_6^-$	31.9
$SeCN^-$	64.7
$1/2SeO_4^{2-}$	75.7
$1/2WO_4^{2-}$	69

Organic cations

Benzyltrimethylammonium	34.6
i-Butylammonium	38
Butyltrimethylammonium	33.6
n-Decylpyridinium	29.5
Decyltrimethylammonium	24.4
Diethylammonium	42.0
Dimethylammonium	51.8
Dipropylammonium	30.1
n-Dodecylammonium	23.8
Dodecyltrimethylammonium	22.6
Ethanolammonium	42.2
Ethylammonium	47.2
Ethyltrimethylammonium	40.5
Hexadecyltrimethylammonium	20.9
Hexyltrimethylammonium	29.6
Histidyl	23.0
Hydroxyethyltrimethylarsonium	39.4
Methylammonium	58.7
Octadecylpyridinium	20
Octadecyltributylammoniuim	16.6
Octadecyltriethylammonium	17.9
Octadecyltrimethylammonium	19.9
Octadecyltripropylammonium	17.2
Octyltrimethylammonium	26.5
Pentylammonium	37
Piperidinium	37.2
Propylammonium	40.8
Pyrilammonium	24.3
Tetra-*n*-butylammonium	19.5
Tetradecyltrimethylammonium	21.5
Tetraethylammonium	32.6
Tetramethylammonium	44.9
Tetra-*i*-pentylammonium	17.9
Tetra-*n*-pentylammonium	17.5
Tetra-*n*-propylammonium	23.4
Triethylammonium	34.3
Triethylsulfonium	36.1
Trimethylammonium	47.23
Trimethylhexylammonium	34.6
Trimethylsulfonium	51.4
Tripropylammonium	26.1

Organic anions

Acetate	40.9
p-Anisate	29.0
$1/2$Azelate^{2-}	40.6
Benzoate	32.4
Bromoacetate	39.2
Bromobenzoate	30
n-Butyrate	32.6
Chloroacetate	42.2
m-Chlorobenzoate	31
o-Chlorobenzoate	30.2
$1/3$Citrate^{3-}	70.2
Crotonate	33.2
Cyanoacetate	43.4
Cyclohexane carboxylate	28.7
$1/2$ 1,1-Cyclopropane-dicarboxylate^{2-}	53.4
Decylsulfate	26
Dichloroacetate	38.3
$1/2$Diethylbarbiturate^{2-}	26.3
Dihydrogencitrate	30
$1/2$Dimethylmalonate^{2-}	49.4
3,5-Dinitrobenzoate	28.3
Dodecylsulfate	24
Ethylmalonate	49.3
Ethylsulfate	39.6
Fluoroacetate	44.4
Fluorobenzoate	33
Formate	54.6
$1/2$Fumarate^{2-}	61.8
$1/2$Glutarate^{2-}	52.6
Hydrogenoxalate	40.2
Isovalerate	32.7
Iodoacetate	40.6
Lactate	38.8
$1/2$Malate^{2-}	58.8